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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/714,972	11/18/2003	Rabah Boukherroub	44768-A	4624

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EXAMINER

HAQ, SHAFIQUK

ART UNIT	PAPER NUMBER
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1641

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/714,972	Applicant(s) BOUKHERROUB ET AL.	
	Examiner Shafiqul Haq	Art Unit 1641	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 22 and 26-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 22 and 26-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>11/18/03</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to restriction/election

1. Applicants' election of Group III, claims 22 and 26-43 filed February 2, 2007 in response to Office Action mailed October 06, 2006 is acknowledged and entered. Since the election is made without traverse, the restriction requirement is deemed proper and is made FINAL.
2. Claims 22 and 26-43 are pending and are examined on merits.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claims 22 and 26-43 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. With regard to claims 22 and 37, it is unclear what is meant to be encompassed by the term "desired molecule" since the feature which are "desired" are not specified. The specification fails to define the intended scope of this term.
6. Claim 37 recites the phrase "a modified silicon surface". It is unclear as well as vague and indefinite as to what "modification of silicon surface" is intended to encompass by the phrase "modified silicon surface".

Claim 1 recites the phrase "optionally reacting the Si-H surface with a linker-molecule" is step (B). The term "optionally" is not a positive recitation and thus it may be interpreted that the step of reacting Si-H bond with a linker-molecule is not a

required component of the claimed invention. Therefore, it is unclear as to what steps of the method Applicants are intended to encompass in the claimed invention. Furthermore, step (E) recites the phrase "reacting the coupling group with the desired molecule; or". The term "or" make the claim vague and indefinite because as written steps (B) to (E) are optional step and the term "or" makes it more confusing as to whether step (F) is a required step or an optional step like steps (B) to (E). It is unclear as well as confusing what applicants are intended to claim in this claim. The novel or inventive concept/limitation in this method claim is unclear.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 37-40 are rejected under 35 U.S.C. 102(a) as being anticipated by Boukherroub et al. (J. Am. Chem. Soc. 1999).

Boukherroub et al. describe a method of reacting a Si-H derivatized surface (i.e. a modified silicon surface) with a "desired molecule" to form a Si-C bond with the Si moiety. See Boukherroub et al: reaction sequences (1) through (6).

9. Claims 37-42 are rejected under 35 U.S.C. 102(a) as being anticipated by Strother et al. (J. Am. Chem. Soc. 2000).

Strother et al. describe a method of reacting a Si-H derivatized surface (i.e. a modified silicon surface) with a "desired molecule" to form a Si-C bond. Strother et al also disclose attachment of desired molecule such as DNA to the derivatized surface (see abstract and Figure 1).

10. Claims 37-43 are rejected under 35 U.S.C. 102(a) as being anticipated by Stewart et al. (Advanced Materials 2000).

Stewart et al. describe methods of reacting a porous Si-H and Si-OH derivatized surface (i.e. a modified silicon surface) with a "desired molecule" for attachment by a Si-C or Si-O bond (see Figure 3). Stewart et al also disclose that Si-H terminated surface can be oxidized either thermally or by ozonolysis and linking with alkoxysilane and then can be attached to biomolecules (e.g. DNA, proteins) and in that case biomolecule is attached to silicon surface via a Si-O bond (see paragraph 5.2, first and second paragraph of right column).

Therefore, the reference is deemed to anticipate the cited claims.

11. Claims 37-42 are rejected under 35 U.S.C. 102 (b) as being anticipated by Wagner et al. (Journal of Structural Biology 1997).

Wagner et al. describe a method of reacting a Si-H derivatized surface (i.e. a modified silicon surface) with a "desired molecule" to form a Si-C or Si-O bond with the Si moiety. See Wagner et al: page 190, first column, second full paragraph; page 190, second column, first and second full paragraphs; page 191, Monolayer formation formation and Functionalization of Monolayers and page 196, Figure 5, which describe hydrogenated silicon surface attached to derised molecules through

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Si-C bond and functionalized surface with reactive molecule (e.g. NHS , sulfonylchloride, sulfonamide, etc) for coupling to amino group containing biomolecules (e.g. DNA).

Therefore, the references are deemed to anticipate the cited claims.

12. Claims 22, 28-32 and 37-42 are rejected under 35 U.S.C. 102 (b) as being anticipated by Sandoval et al. (US 5,326,738).

Sandoval et al. describe a method of reacting a Si-H derivatized surface (i.e. a modified silicon surface) with a "desired molecule" to form a Si-C bond. See Sandoval et al.: col 5, lines 1-5 and column 9, lines 20-55, which describes hydrogen terminated derivatized silicon surface for coupling with a bifunctional linker molecule that forms Si-C bonds with hydrogenated silicon surface and also having a reactive functional groups (e.g. NHS, epoxide etc.) for coupling to biomolecules. Sandoval et al. describe the reaction of an alkene-linker-functional group conjugate ($\text{CH}_2=\text{CH}-(\text{CH}_2)_n\text{-G}$) with a silicon surface to form an Si-C bond through the reaction of the alkene group with the "hydride substrate". The functionality "G" is "reactive" and includes groups such as an N-hydroxysuccinimide ester (col. 9, line 45) which are readily bound to ligands with specific biochemical activity (col. 9, lines 20-55). For other functional groups which may be present on the alkene reagent see col. 7, lines 19-23; col. 8, lines 23-29. As for biomolecules nucleic acids, proteins and their fragments are disclosed.

Therefore, the references are deemed to anticipate the cited claims.

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13. Claims 37-40 are rejected under 35 U.S.C. 102 (b) as being anticipated by each of Linford et al (US 5,429,708) or Sieval et al. (Langmuir 1998).

Each of the references describes a method of reacting a derivatized silicon surface (i.e. a modified silicon surface) with a "desired molecule" to form a Si-C or Si-O bond. See Linford et al: col.5, lines 15-59; col. 4 lines 22-43 and Figs. 1-15; Sieval et al.: abstract and Figure 1.

14. Claim 22, 26-32 and 36-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Effenberger et al. (Angew. Chem. Int. Ed. 1998).

Effenberger et al. disclose a method for immobilizing a desired molecule on a silicon surface and the method comprises providing a hydrogen-terminated Si(111) surface (i.e. Si-H surface) and reacting the Si-H surface with a "desired molecule" (e.g. $\text{CH}_3\text{-CH}_2\text{-(CH}_2\text{)}_{14}\text{-CH}_2\text{-CHO}$, octadecanal, see scheme 1) having at least one anchor functionality (e.g. CHO) capable of reacting with Si-H to form a Si-O bond (see scheme 1). The CHO functionality of the desired molecule reads on the functionality as claimed in instant claim 22. See also Table 1, which discloses reacting Si-H surface with Octadecene 1 $\{\text{CH}_3\text{-(CH}_2\text{)}_{15}\text{-CH=CH}_2\}$, which forms a Si-C bond.

As described in claim 22, the steps (B) – (E) employing linker-molecule are optional steps, and thus are considered not to be a required components of claimed invention. Therefore, claim 22 has been treated as being comprising only steps (A) and (F) which encompasses providing an Si-H surface on a silicon substrate and reacting the Si-H surface with a desired molecule possessing at least one anchor

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functionality capable of reacting with the Si-H surface to form an Si-C or SiO linkage and wherein the functionality of reacting with the Si-H surface is selected from the group consisting of aldehyde, ketone and hydroxyl. Therefore, claims 28-32 which are dependent on optional steps (B)-(E) (i.e. not a required step) has not given any patentable weight.

The claims, as written, do not describe any feature which defines a novel or inventive concept/limitation *vis a vis* the processes of the prior art.

Therefore, the reference is deemed to anticipate the cited claims.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. Claims 33-35 are rejected under 35 U.S.C. 102(b) as being unpatentable over Effenberger et al. (Angew. Chem. Int. Ed. 1998) in view of Wagner et al. (Journal of Structural Biology 1997).

See above teaching of Effenberger et al.

Effenberger et al. differ from claims 33-35 of instant application in failing to disclose a RNA, a DNA, a protein or a conjugate of these molecules as desired molecules.

Effenberger et al. disclose that a compound with aldehyde functionality can be attached covalently to hydrogen terminated silicon surface. Since nucleic acid and proteins are known to have aldehyde groups, it would be obvious to one of ordinary skill in the art at the time the invention is made to add desired nucleic acid molecules or protein molecules directly to the hydrogen terminated surface for attachment to the hydrogen terminated silicon surface.

17. Claims 43 is rejected under 35 U.S.C. 103 (a) as being unpatentable over each of 1) Wagner et al. (Journal of Structural Biology 1997) or Sandoval et al. (US 5,326,738) in view of 2) Iwasa et al. (US 4,517,290).

See above teaching of Wagner et al. or Sandoval et al.

Wagner et al. or Sandoval et al. disclose attachment of biomolecules such as DNA to hydrogen terminated surface but however, fail to disclose antibody as a biomolecule for attachment to hydrogen terminated surface.

Wagner et al. disclose NHS, chlorosulfone and sulfonamide reactive group for coupling to amino group containing biomolecules. Although, Wagner disclosed biomolecule DNA, other biomolecules such as amino containing proteins are also encompassed by amino group containing biomolecules. Sandoval et al. disclose that biomolecules may include nucleic acid, protein and their fragment. However, both the prior art are generic with regard to protein being attached.

Iwasa et al. in an immunoassay method disclose antibody immobilized on a solid phase (e.g. silicon substrate) ((column 9, lines 20-28).

Since immobilization of antibody to a solid surface is very common and known in immunoassay method (Iwasa et al.) and for various purification/isolation methods, it would be obvious to one of ordinary skill in the art at the time the invention was made, to immobilize antibody on the silicon surface of Wagner et al. or Sandoval et al. because both Wagner et al. or Sandoval et al. disclose immobilizing biomolecules including proteins to solid substrate but are generic with regard to the protein.

Therefore, antibody, which is a protein would be obvious to attach to a solid substrate for the teaching of Iwasa and from the very common knowledge of immobilizing antibody to solid phase for various immunochemical application.

Double Patenting

18. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

19. Claims 22, 26-43 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,677,163 B1. Although the conflicting claims are not identical, they are not patentably distinct from each other because claim 1 of the patent is the same as the steps (A) to (E) of instant claim 22 provided that step (F) is not required (see the term "or" in step (E) which indicated that step (F) is not required). US patent '163 requires coupling group selected from carboxyl and NHS, which are the same coupling groups as claimed in instant application.

Therefore, claims of instant application requiring desired molecules not having aldehyde, ketone and hydrozyl functionality (i.e. without step F) are the same as the claims in US patent '163 and are thus obvious.


Conclusion

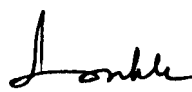
20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shafiqul Haq whose telephone number is 571-272-6103. The examiner can normally be reached on 7:30AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long V. Le can be reached on 571-272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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